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Scorpions (Arachnida, Scorpiones) from the Balkan Peninsula in the collection of the National Museum of Natural History, Sofia

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Introduction

Scorpiofauna of the Balkan countries is not well studied. Although numerous papers have been published over more than 150 years describing scorpion taxa from this region, the modern-level synthesis has never been achieved, and even species composition is not clear, especially in the extremely polymorphic genus *Euscorpius* Thorell, 1876 (Euscorpiidae). The most important work up to date is that of Kinzelbach (1975) who compiled all known data on the circum-Aegean region, including all of mainland and island Greece, and also Turkey; some new data on this area were added by Fet (1986) and Kritscher (1993). Fauna of scorpions of the former Yugoslavia was discussed in some detail by Hadzi (1929, 1930), Caporiacco (1950), and Ćurčić (1972) but the taxonomic criteria in these works are now outdated. The recent workers on Greece (Michalis, Dolkeras, 1989) also applied outdated taxonomic criteria. Virtually no data, except some old or brief records (Yurinich, 1904; Giltay, 1932; Daniel, 1959), exist for Bulgaria and Albania. Recent work on scorpions of the adjacent regions, especially on Italy (Bonacina, 1980), Austria (Scherabon, 1987), Caucasus (Fet, 1993) and the Crimea (Fet, 1997a), demonstrated difficulties and gaps in our taxonomic and biogeographic knowledge. This is why the scorpiofauna of the Balkan region requires a close attention; new molecular (mitochondrial DNA) data (Gantenbein et al., 1999) indicate that it can serve as a good model system for studying both ancient and recent speciation.

Material and methods

I analysed 173 scorpion specimens deposited in the collection of the National Museum of Natural History, Sofia, Bulgaria (NMNHS), preserved in 75 % ethanol.

Scorpions were identified and studied according to the diagnostic external morphological features, first of all carination of metasoma and variation in trichobothriotaxy (number and position of trichobothria on the pedipalp). Trichobothrial formulae were scored according to the standard techniques (VACHON, 1975; FET, 1993, 1997a). Abbreviations used below are: P.B. - P. Beron leg., Tv - number of trichobothria on the ventral aspect of pedipalp patella (= "tibia"), scored from base to apex; Te - same, on the external aspect, including the following "series" (clusters of 2 to 9) of trichobothria: *et* - terminal; *est* - subterminal; *em* - median; *esb* - suprabasal; eb_a - basal "a"; and *eb* - basal; also *et*, *est* and *dsb* - external terminal, external subterminal, and dorsal suprabasal individual trichobothria on the fixed finger of the pedipalp chela. In scoring the bilateral meristic characters (pectinal plates, trichobothrial series) the left side is scored first. All linear measurements are given in mm. Selected duplicate specimens from NMNHS are deposited in the collection of the United States National Museum (USNM, Smithsonian Institution, Washington, D.C., USA), with the kind permission of Dr. P. Beron.

Results and discussion

The NMNHS collection contains four species of scorpions belonging to three families and originating from the Balkan countries (Albania, Bulgaria, and Greece), collected mainly by Dr. Petar Beron in 1960-1993. Although the species number in this region is not high, the taxonomy of the most typical regional element found here, the Southern European-Mediterranean genus *Euscorpius* (Euscorpiidae) is so complicated (FET, 1997a, b) that it requires a special treatment and analysis. Below, I give a list of species and localities which is accompanied by the detailed discussion of the genus *Euscorpius*.

Buthidae

***Mesobuthus gibbosus* (Brullé, 1832)**

A very common Eastern Mediterranean species (found from Albania to Lebanon), and the only representative of Buthidae (and of mainly Asian genus *Mesobuthus*) in the Balkans. NMNHS collection has 16 specimens from Albania and Greece (including the Aegean islands of Kythira, Kithnos, Serifos, Tinos, Chios, Karpathos, Rhodes, and Crete).

Albania

2 ♀♀, 1 juv. (No. 132), Ionian Sea, Dhermi, 24.01.1993 (P.B.).

Greece

1 ♀ (No. 48), Peloponnesos, 09. 1981 (P.B.).

1 ♀, 1 ♂ (No. 166), Kythira, near airfield, 30.04.1987 (P.B.).
1 ♀, 1 juv. (No. 159), Kithnos, Dryopis, 9.05.1987 (P.B.).
1 ♀, 1 ♂ (No. 99), same locality, 15.05.1984 (P.B.).
1 ♀ (No. 92), same locality, 16.05.1987 (P.B.).
1 ♂ (No. 91), 1 ♀ (No. 93), Serifos, Coutalas, 0-300 m, 22.04.1984 (P.B.).
1 ♀, 2 subad. ♂♂ (No.35), 1 ♀ (No. 54), Tinos, 1.10.1974 (P.B. and V. Beshkov).
2 ♀♀ (No.160, No. 165), Chios, Passa Limani, 14.05. 1987 (P.B.).
1 juv. (No. 154), Chios, Nea Moni, 13.05.1987 (P.B.).
1 ♀ (No. 89), Karpathos, Archangel Michail, 800-1000 m, 4.05.1984 (P.B.).
1 ♀ (No. 94), Rhodes, Lindos, 30.04.1984 (P.B.).
1 ♀ (No. 97), Rhodes, Lardos, 1.05.1984 (P.B.).
1 juv. ♀ (No.167), Rhodes, Archangelos, 1.05.1987 (P.B.).
1 ♂ (No. 116), Crete, Psiloritis, 1600-2000 m, 11.05.1984 (P.B.).

Iuridae

Iurus dufoureius (Brullé, 1832)

The only species of a monotypic genus, and an interesting relict, endemic to the southern Aegean area (from Peloponnesus to southern Anatolia, including the islands of the southern Aegean arch). NMNHS collection has four specimens from Greece.

Greece

1 ♀, 1 ♂ (No. 68), Peloponnesos, Laconia, Mystras, 18.09.1983 (P.B. & V. Beshkov).
1 ♂ (No. 96), Kasos, Stylokamara Cave, 6.05.1984 (P.B.).
1 ♀ (No. 158), Rhodes, Archangelos, 2.05.1987 (P.B.).

Euscorpiidae

Euscorpius beroni n. sp.

Material. Holotype: ♀ (NMNHS No. 137), Albania, Shkoder District, Boga, Maya Tchardakut, 1400-1800 m, 1.06.1993 (P.B.). Paratypes: 1 ♀ (USNM), same label as holotype; 1 ♂ (USNM), 1 ♀, 3 juv. (NMNHS No. 142), Albania, Shkoder District, Boga, upper camp, 1800-1900 m, 20-25.06.1993 (P.B. and B. Petrov); 3 ♀♀ (NMNHS No. 134), Albania, Shkoder District, Mt. Radohimës, 2200-2400 m, 29.05.1993 (P.B.).

Diagnosis. This species belongs to the complex "*Euscorpius mingrelicus*" which is indicated by an almost obsolete metasomal carination and a high (in the

new species, average 2,10) ratio of distance between trichobothria *et* and *est* to the distance between *est* and *dsb* on the fixed finger of the pedipalp chela.

Etymology. The species is named after its collector, Dr. Petar Beron (Sofia, Bulgaria).

Description. Holotype ♀. A small scorpion, with background coloration medium brown; abdominal part of the mesosoma light brown; legs, pedipalps, and telson brownish, legs, pedipalps and chelicerae with fuscous dark pattern. Surface of tergites, pedipalps femur and patella, and carapace finely granular. Metasomal carinae almost obsolete; ventromedian and ventrolateral carinae absent; traces of dorsolateral carinae with sparse granules (not denticles) on metasomal segments I to IV. Dorsal furrow is present on metasomal segments I to IV, obsolete in the most of metasomal segment V. Telson with darker ventral longitudinal stripe. Number of pectinal plates 7-8. Trichobothrial formula on the pedipalp patella: Tv = 5-5; Te = 21; *et* = 4; *est* = 4; *em* = 3; *esb* = 2; eb_a = 4; *eb* = 4. Measurements: carapace length 3,85; chela manus length 3,95; chela fixed finger length 2,80; metasomal segment V length 3,48; telson length 3,72; telson height 1,12; ratio telson length/telson height 3,32; ratio *et* - *est* / *est* - *dsb* 2,14.

Paratype ♂. Diagnostic characters as in ♀; telson only slightly inflated; number of pectinal plates 9-10. Trichobothrial formula as in the holotype. Measurements: carapace length 2,80; chela manus length 2,46; chela fixed finger length 1,95; metasomal segment V length 2,46; telson length 2,88; telson height 1,2; ratio telson length/telson height 2,40; ratio *et* - *est* / *est* - *dsb* 2,00.

Variation. Among seven ♀♀ paratypes, number of pectinal plates was 8-8 (3 cases), 8-7 (2), 7-8 (1) and 7-7 (1). Trichobothrial formulae were as in the holotype, with the following exceptions: Tv = 5-6 (1 case), *em* = 2-3 (1) and 2-2 (1). Morphometric values (measured for all six adult ♀♀, including holotype) varied as follows: carapace length, average 3,49, SD 0,26; chela manus length, average 3,37, SD 0,43; chela fixed finger length, average 2,64, SD 0,23; metasomal segment V length, average 3,06, SD 0,30; telson length, average 3,35, SD 0,36; telson height, average 1,10, SD 0,09; ratio telson length/telson height, average 3,06, SD 0,45; ratio *et* - *est* / *est* - *dsb*, average 2,21, SD 0,15.

Geographic and altitudinal ranges. Known only from the high mountains (1400 to 2400 m) of the Prokletija massif in the northwestern Albania (Shkoder District). Scorpions have been found on the Mt. Radohimës up to the summit at 2569 m (P. Beron, pers. comm.).

Comments. Recently, Fet (1993) reviewed all known distribution and taxonomic composition of the species (*sensu lato*) *Euscorpius mingrelicus* (Kessler, 1874) which was described from Georgia (Caucasus) but later also identified (Bonacina, 1980) as a part of the former species *Euscorpius germanus* (C. L. Koch, 1837). While the latter species is in fact limited to the Alpine zone of Europe, the much more widespread *Euscorpius mingrelicus* is found from the Isonzo (Soca) River valley in Italy and Slovenia to the Georgian and Russian

coasts of the Black Sea. Within this range, the species exhibits high morphological variation with several subspecies described from Slovenia, Croatia, Bosnia and Turkey (Bonacina, 1980; Fet, 1993; Lacroix, 1995). It is highly likely that it represents in fact a species complex, as do numerous other terrestrial invertebrates with a Balkan-Caucasian range. A new species from Albania, *E. beroni* n. sp., is a part of this complex but its characters (especially the trichobothrial number on the external aspect of the pedipalp patella and ratio *et - est / est - dsb* on the fixed finger of the pedipalp chela) clearly indicate its difference from, and separate standing among, several other Balkan forms (Bonacina, 1980) as well as from the Anatolian-Caucasian group of "subspecies" clustering around the nominotypical form (Fet, 1993; Lacroix, 1995). No species of the "*mingrelicus*" complex was yet recorded for Albania. Ongoing molecular studies (Gantenbein et al., 1999; Gantenbein, Fet et al., in progress) indicate that the separate "*germanus*" and "*mingrelicus*" complexes might belong to an ancient, montane Alpine-Balkan-Caucasian lineage within the genus *Euscorpius*, and most likely include a number of isolated species (which may or may not have well-defined morphological features).

Euscorpius carpathicus* (Linnaeus, 1767), *sensu lato
(="*Euscorpius carpathicus*" complex)

The NMNHS collection has 143 specimens belonging to this complex (species *sensu lato*) from Albania, Bulgaria and Greece. According to the observed morphological features, I separated all studied specimens into several phenotypic groups and subgroups (introduced here with their diagnostic features) to which at this moment I choose not to ascribe any of the numerous known Latin names as subspecies or species. Below, I listed records for each "group" (and a "subgroup" within), with the original, detailed trichobothrial scores for each entry, followed by the discussion.

"Group A". A light-colored form, with moderately reduced metasomal carination and granulation of the carinae; with low to medium trichobothrial numbers on the pedipalp patella ("oligotrichous"). Tv varies from 7 to 10. External series usually with Te from 23 to 25 due to the variation of *et* from 5 to 7; always *est* = 4; practically always (with extremely rare exceptions) *em* = 4, *esb* = 2, eb_a = 4, *eb* = 4.

"Subgroup A1" (47 specimens): Tv from 7 to 8 (average 7,45) with a bimodal distribution (45 % of the scored pedipalps have 7, and 52 % have 8). Te from 23 to 24; *et* from 5 to 6 (average 5,58) with a bimodal distribution (38 % have 5, and 52 % have 6).

Bulgaria

2 ♀♀, 3 ♂♂, 1 ♂ juv. (NMNHS No. 4), 1 ♀, 1 ♂ (USNM), East Rhodope Mts, Kurdzhali District, Devesili, 4.06.1982 (P.B.). Tv = 6-7 (2 cases), 7-7 (4), 8-7 (1); *et* = 4-5 (1), 5-5 (3), 6-5 (1), 6-6 (1).

1 ♂ (No. 4), Pleven District, Bezhanovo, Georgicovata Cave, 11.10.1973 (A. Petkova). Tv = 7-8; *et* = 5-6.

5 ♀♀ (No. 108), 2 ♀♀, 3 ♂♂ (No. 113), Burgas District, Sv. Vlas, Emine, 22.08.1983 (K. Marincheva). Tv = 7-7 (2), 7-8 (3), 8-7 (3), 8-8 (2); *et* = 5-5 (1), 5-6 (1), 6-5 (1), 6-6 (6), 7-7 (1).

1 ♀ (No. 11), 8.05.1981; 2 ♀♀, 2 ♂♂ (No. 2), Blagoevgrad District, Paril, near Rupata Cave, 9.05.1981 (P.B. & S. Andreev). Tv = 7-7 (1), 7-8 (1), 8-7 (1), 8-8 (2); *et* = 5-5 (1), 6-6 (4); *em* = 4-4 (3), 4-3 (2).

2 ♀♀, 2 ♂♂, 1 ♂ juv. (No. 7), 2 ♀♀, 3 ♂♂ (No. 13, now in USNM), Blagoevgrad District, Ilinden, locality Pozlaka, 6.05.1981 (P.B., S. Andreev & V. Pomakov). Tv = 7-7 (3), 7-8 (2), 8-7 (3), 8-8 (2); *et* = 5-5 (10).

2 ♂♂, 1 ♀ juv. (No. 88), 1 ♂ (USNM), Blagoevgrad District, Melnik, 29.04.1983 (P.B., S. Andreev & V. Pomakov). Tv = 7-7 (3), 7-8 (2), 8-7 (3), 8-8 (2); *et* = 5-5 (10).

3 ♀♀, Blagoevgrad District, Goleshovo, near the karstic source, 10.05.1984 (P.B. & S. Andreev). Tv = 7-7 (1), 7-8 (1), 8-8 (1); *et* = 5-5 (1), 6-5 (1), 6-6 (1).

2 ♂♂ (No. 31), Blagoevgrad District, Musomishta, locality Grebenaro, litter (P.B. & S. Andreev). Tv = 7-7 (2); *et* = 5-5 (2).

2 ♀♀, 1 ♂ (No. 49), Mikhailovgrad (now Montana) District, Beli Mel, 13.06.1973 (P.B). Tv = 7-8 (1), 8-8 (2); *et* = 6-6 (3).

Greece

1 ♂ (No. 55). Thessaly, Mt. Olympus, 1700 m, 17.09.1974 (P.B. & V. Beshkov). Tv = 7-8; *et* = 6-6.

2 ♀♀ (No. 153). Macedonia, Drama District, Xiropotamos, 10.04.1993 (P.B.). Tv = 7-8, 8-8; *em* = 4-4, 4-5; *et* = 7-7, 5-5.

2 ♀♀, 1 ♂ (No. 168). Thrace, Evros District, Avas, 17.05.1987 (P.B.). Tv = 7-8 (2), 8-8 (1); *et* = 5-6 (1), 6-6 (1), 7-6 (1).

1 ♀ (No. 162). Thrace, Evros District, Essimi, 18.05.1987 (P.B.). Tv = 7-7; *et* = 4-5.

"**Subgroup A2**" (11 specimens). Tv usually 9 (82 % of the scored pedipalps, average 8,91). Te from 24 to 25 due to the variation of *et* from 6 to 7 (average 6,54) with a bimodal distribution (42 % have 6, and 58 % have 7).

Bulgaria

1 ♀ (No. 109), Sofia District, Rebrovo, 9.10.1980 (P.B.). Tv = 9-8; *et* = 6-6.

1 ♀ (No. 36), 1 ♀, 1 ♂ (USNM), Sofia District, Tserovo station, 24.05.1964 (P.B.). Tv = 9-9 (2), 8-9 (1); *et* = 6-6 (1), 7-7 (2).

4 ♀♀, 1 ♂ (No. 114), Sofia District, Zanoge, 1100-1300 m, 2.05.1985 (P.B.). Tv = 8-9 (1), 9-9 (3); *et* = 6-6 (3), 7-7 (1).

1 ♀, 1 ♂ (No. 45), Plovdiv District, Bachkovsky Monastery, 18.06.1960 (P.B.). Tv = 9-10 (1), 9-9 (1); *et* = 7-7 (2).

1 ♀ (No. 39), Veliko Turnovo District, Arbanasi, Lyaskovskata Cave, 6.08.1968 (P.B.). Tv = 9-9 (1); *et* = 7-7.

"Subgroup A3" (21 specimens). All indices are close to subgroup A2 but with a greater variance of Tv, usually from 8 to 10 (average 8,89), with a trimodal distribution (27 % of the scored pedipalps have 8, 37 % have 9, and 26 % have 10). Te from 24 to 25 due to the variation of *et* from 6 to 7 (average 6,40) with a bimodal distribution (44 % have 6, and 46 % have 7).

Greece, Aegean Islands (Kythira, Paros, Serifos, Iraklia, Amorgos, Kasos, Karpathos, Rhodes, and Crete)

1 ♀, 1 ♂ (No. 164), Kythira, Miteta, 28.04.1984 (P.B.). Tv = 9-8 (1), 9-9 (1); *et* = 5-6 (1), 6-6 (1).

2 ♀♀, 1 ♂ (No. 169), Kythira, Mylopotamos, 27.04.1987 (P.B.); 2 ♀♀ (No. 161), same locality, 9.05.1987 (P.B.). Tv = 7-8 (1), 8-8 (1), 8-9 (1), 9-9 (2); *et* = 6-6 (3), 6-7 (2).

1 ♀, 1 ♂ (No. 58), Paros, Marathi, cave - marble quarry, 23.12.1982 (P.B. & S. Andreev). Tv = 8-9 (1), 9-9 (1); *et* = 6-6 (1), 6-7 (1).

1 ♂ (No. 61), Iraklia, small cave, 15.09.1981 (P.B. & A. Bartsiokas). Tv = 8-9; *et* = 6-7.

1 ♂ (No. 1), Amorgos, Katapola, 13.09.1981 (P.B. & A. Bartsiokas). Tv = 8-8; *et* = 6-6.

1 juv. ♂ (No. 96), Kasos, Stylokamara Cave, 6.05.1984 (P.B.). Tv = 8-8; *et* = 6-6.

1 ♂ (No. 98), Karpathos, Archangel Michail, 1000-1215 m, 4.05.1984 (P.B.). Tv = 8-8; *et* = 6-6.

1 ♀, 1 ♂ (No. 40), Crete, Lefka Ori, 1500 m, 25.09.1974 (P.B.). Tv = 9-9 (1), 10-10 (1); *et* = 7-6 (1), 7-7 (1).

1 juv. ♂ (No. 41), Crete, Lefka Ori, 2200 m, 25.09.1974 (P.B.). Tv = 10-9; *et* = 7-7.

1 ♀, 1 juv. ♀, 1 ♂ (No. 115), Crete, Psiloritis, 1600-2000 m, 11.05.1984 (P.B.). Tv = 10-9 (1), 10-10 (1), 10-11 (1); *et* = 7-7 (2), 8-7 (1).

2 juv. ♀♀ (No. 56), Crete, Rethymnon District, Melidoni, 14.01.1968 (P.B.). Tv = 10-10 (1), 10-11 (1); *et* = 7-7 (1).

In addition to the island forms listed above under Subgroup A3, an unusual ♂ (No. 95, now in USNM) from Serifos (Coutalas, 0-300 m), 22.04.1984 (P.B.) has Tv = 7-7; *em* = 3-2; *et* = 5-5.

"Group B". A dark-colored form, with pronounced metasomal carination and coarse granulation and denticulation of carinae; with medium to high trichobothrial numbers on the pedipalp patella ("mesotrichous" or "polytrichous"). Tv varies from 9 to 12 (usually from 10 to 11). Te from 27 to 30; *et* varies from 7 to 8; *em* = 4 (rarely 5); eb_{α} = 5 to 6, *eb* = 5 to 6. Always *esb* = 2.

"Subgroup B1" (27 specimens). Tv varies from 9 to 10 (average 9,71) with an uneven bimodal distribution (23 % of scored pedipalps have 9, and 66 % have 10). Te from 27 to 29; *et* varies from 7 to 8 (average 7,22), with a bimodal distribution (70 % of scored pedipalps have 7, and 28 % have 8); eb_a varies from 5 to 6 (average 5,54), with a bimodal distribution (43 % of scored pedipalps have 5, and 54 % have 6). If not otherwise specified, *em* = 4-4, *eb* = 5-5.

Bulgaria

4 ♀♀, 1 ♀ juv. (No. 117), 2 ♀♀, 1♂ (USNM), Pazardzhik District, Gabrovnica, left bank of Maritsa, stream Dalbochitsa, 6.04.1986 (P.B.). Tv = 9-9 (3), 10-9 (1), 10-10 (4); *et* = 7-7 (3), 7-8 (2), 8-7 (2), 8-8 (1); *em* = 4-4 (7), 5-4 (1); eb_a = 5-5 (1), 5-6 (1), 6-5 (1), 6-6 (5); *eb* = 5-5 (7), 4-5 (1).

1 ♀, 1 juv. (No. 111), 2 ♀♀ (USNM), Blagoevgrad District, Petrich, 29.07. 1983 (K. Marincheva). Tv = 10-10 (3); *et* = 7-7 (3); eb_a = 5-6 (1), 6-6 (2).

2 ♀♀, 1 ♂♂ (No. 6), 1 ♀, 1 ♂ (USNM), Blagoevgrad District, Samuilovo, litter under *Castanea*, 11.05.1981 (P.B., S. Andreev & V. Pomakov). Tv = 10-10 (4), 8-9 (1); *et* = 7-7 (2), 8-6 (1), 8-8 (2); eb_a = 5-5 (3), 6-6 (1), 6-7 (1).

2 ♀♀, 1 ♂ (No. 110), Blagoevgrad District, Rybnitsa, 31.07.1983 (K. Marincheva). Tv = 9-8 (1), 9-9 (1), 8-9 (1); *et* = 7-7 (2), 6-7 (1); eb_a = 5-5 (3).

1 ♀ (No. 112), Blagoevgrad District, Melnik, 1.08. 1983 (K. Marincheva). Tv = 10-10; *et* = 7-7; eb_a = 5-5.

2 ♀♀, 1 ♂ (No. 3), Blagoevgrad District, waterfall near Kresna station, 14.05.1981 (P.B. & S. Andreev). Tv = 10-10 (2), 10-9 (1); *et* = 7-7 (3); eb_a = 5-5 (1), 6-6 (2); *eb* = 5-5 (2), 4-5 (1).

2 ♀♀, 1 ♂ (No. 87), Blagoevgrad District, Kresna, 30.04. 1983 (P. B. & K. Marincheva). Tv = 10-10 (2); 10-9 (1); *et* = 7-7 (3); eb_a = 5-5 (1), 6-6 (2).

"Subgroup B2" (34 specimens). Tv is usually 11 (in 78 % of all cases; average 11,0). Te from 29 to 30; *et* from 7 to 8 (average 7,61) with a bimodal distribution (40 % of scored pedipalps have 7 and 54 % have 8). Always *esb* = 2; if not otherwise specified, *em* = 4-4, eb_a = 6-6; *eb* = 6-6.

Albania

3 ♀♀ (No. 141), 2 ♀♀, 1 ♂ (No. 144), Shkoder District, Theth, 800-900 m, 28.05.1993 (P.B.). Tv = 11-11 (5), 11-12 (1); *et* = 7-7 (2), 7-8 (1), 8-7 (1), 8-8 (2); *em* = 4-4 (2), 5-4 (1); *eb* = 6-5 (1), 6-6 (5).

1 ♀, 1 ♂ (No. 133), 1 ♀ (No. 136), 2 ♀♀, 1 ♂ (No. 140), 1 ♀, 1 ♂ (No. 143), 1 ♀, 1 ♂ (No. 145), 2 ♀♀, 1 ♂ (No. 147), 2 ♀♀, 1 ♂ (USNM), Shkoder District, Boga, 1000-1100 m, 5-9.06.1993 (P.B. & B. Petrov). Tv = 11-10 (3); 11-11 (9), 12-10 (1), 12-11 (1), 12-12 (2); *et* = 7-7 (4), 7-8 (3), 8-7 (1), 8-8 (7), 9-9 (1); *em* = 4-4 (13), 5-4 (1), 4-5 (1), 5-5 (1); eb_a = 5-5 (1), 6-6 (14), 7-6 (1); *eb* = 5-5 (1), 6-6 (15).

2 ♀♀ (No. 148), Shkoder District, Boga, Maya Tchardakut, 1200-1400 m, 1.06.1993 (P.B.). Tv = 11-11 (1), 11-12 (1); *et* = 7-7 (1), 8-9 (1).

2 ♂♂ (No. 146), 1.06.1993; 2 ♂♂ (No. 139), 2.06.1993; Shkoder District, Boga,

Maya Tchardakut, 1400-1600 m (P.B.). Tv = 11-11 (4); *et* = 7-7 (1), 8-8 (3),

1 ♀, 3 ♂♂ (No. 138), Shkoder District, Mt. Radohimës, 1000-1100 m, 5-9.06.1993 (P.B. & B. Petrov). Tv = 10-10 (1), 10-11 (1), 11-11 (2); *et* = 7-7 (2), 7-8 (1), 8-8 (1); eb_a = 6-6 (3), 7-6 (1).

1 ♀ (No. 132), Rrëshen District, Merkurth, under stones, 11.06.1993 (P.B. & B. Petrov). Tv = 11-11; *et* = 7-7; *eb* = 5-5.

To the Group B also belongs one NMNHS sample from **Greece**: 2 ♀♀ (No. 68), Peloponnesos, Laconia, Mystras, 18.09.1983 (P.B. & V. Beshkov). Tv = 10-11 (1), 11-12 (1), *et* = 8-7 (1), 8-8 (1), *est* = 4-4 (2), *em* = 4-4 (2), eb_a = 5-5 (2), *eb* = 5-5.

"Group C". A dark-colored form, with strongly reduced but still traceable metasomal carination and reduced trichobothrial numbers. Tv varies from 6 to 7; Te = 21 to 22; *et* = 4 to 5; *em* = 3, *esb* = 4, em = 3, eb_a = 4, *eb* = 4.

Bulgaria

1 ♀ (No. 517), 2 ♀♀ (USNM), West Rhodope Mts, Smolian District, Trigrad area, Yagodina, 20.05.1983 (P.B.). Tv = 6-7 (1), 7-6 (1), 7-7 (1); *et* = 4-4 (1), 5-5 (2).

Comments. The species *Euscorpius carpathicus* (Linnaeus, 1767) (*sensu lato*) is the most widespread scorpion species in the Mediterranean (from Baleares to Crimea), and one of the most polymorphic species of scorpions in the world. It was described from the "Montibus Carpathicus", probably the Transylvanian Alps of the modern Romania (there are no scorpions in the northern and eastern Carpathian Mts). Kinzelbach (1975) quotes the information from the Linnean Society of London on the Tv = 8 in the alleged holotype ♀ (which would correspond to our Group A). During more than 200 years of taxonomic labors on *E. carpathicus*, over 30 taxa have been described (by such authorities as C. L. Koch, A. Birula, J. Hadzi, L. di Caporiacco) which are referable to this "species". Of these, almost 20 (!) are still formally valid "subspecies" (Caporiacco, 1950; Fet et al., in press). The variation within the species is enormous and quite poorly studied; no modern genetic techniques (chromosomal, allozyme or DNA) have been yet applied to solve taxonomic conundrums which surround *Euscorpius carpathicus*. The first allozyme and mitochondrial DNA data (Gantenbein et al., 1999; Gantenbein, Fet et al., in progress) indicate that there is a considerable variation and at least three separate lineages within this complex which are also closely grouped with a well-defined, separate species *E. italicus* (Herbst, 1800).

Our division of all analyzed Balkan specimens into phenotypic groups and subgroups comes from the realization that the existing criteria (based mainly on trichobothrial scores) are not sufficient for an adequate treatment of *E. carpathicus* complex. No solid criteria exist for delineation of subspecies (or even species) within this complex. Numerous authors who addressed this issue (Hadzi, 1929, 1930, 1931; Caporiacco, 1950; Ćurčić, 1972; Kinzelbach, 1975; Bonacina,

1983; SCHERABON, 1987; FET, 1986, 1997a) used different variable characters, which are often hard to assess and compare beyond a local population. Nevertheless, there are some common patterns, and the new information obtained on the basis of the NMNHS collection helps to clarify important "white spots" in the *E. carpathicus* taxonomic quagmire.

The existence of two groups of forms within *E. carpathicus* was noticed already by CAPORIACCO (1950) who discussed their distribution (mainly in Italy), and sorted all known combinations of morphological characters into an array of forms, splitting *E. carpathicus* in over than twenty subspecies. KINZELBACH (1975), on the other hand, pursued a "lumping" approach. He synonymized many of the known subspecies, and suggested (based on the Aegean region material) the existence of two separate (but hybridizing!) species which most likely correspond to our Groups A and B.

However, the evidence of KINZELBACH (1975) remained unclear since he: (a) analyzed only material from the Aegean area, while extrapolating his conclusions to the entire Mediterranean range of *Euscorpius carpathicus*; (b) used only meristic values of the Tv (ventral patellar trichobothrial series), leaving out much more variable Te (external patellar series); and (c) alleged an unconfirmed theory of hybridogenic origin for some of the *Euscorpius species*, in which intermediate meristic values simply were treated as "mixed characters". Also, KINZELBACH (1975) used an invalid name "*E. mesotrichus* Hadzi" to designate the dark, polytrichous form (species) corresponding to our Group B. This name, which cannot be used since it is a junior homonym (FET, 1997b), formally has a senior synonym, *E. tergestinus* (C. L. Koch) (type locality Trieste, Italy). However, the applicability of the latter name to the entire range of populations claimed by KINZELBACH (1975) is unclear at this moment. In fact, it is even unclear whether the Linnean name *E. carpathicus* is applicable beyond the Romanian populations from the Transylvanian Alps (a "nominotypic subspecies").

The taxonomy of *Euscorpius carpathicus* is far from being resolved. Some authors (e.g. MICHALIS, DOLKERAS, 1989; KRITSCHER, 1993) accepted Kinzelbach's division into two species; others did not (BONACINA, 1983; FET, 1997a; 1997b). Use of the formal subspecies categories without understanding of the genetic structure of a species is of a very limited value; besides, the criteria for subspecies delineation in *Euscorpius* are increasingly unclear. For the true understanding of the "*E. carpathicus*" problem(s), it is necessary to investigate numerous material from the entire range of this complex, with the application of all available (morphological as well as molecular) modern taxonomic techniques. Only then we could decide on the status of numerous, highly variable local forms of the "*E. carpathicus*" complex, and match these forms to the existing, valid names.

Meanwhile, important empirical observations can be certainly made on the Balkan material listed above, based mainly on the analysis of trichobothrial variation (including the new data on the variation in external patellar series).

The NMNHS material clearly falls into at least two major groups (our Group A and Group B), which most likely correspond to *E. carpathicus* (L., 1767) *sensu stricto* and "*E. mesotrichus* Hadzi" which KINZELBACH (1975) accepted as two species. These two groups are distinguished not only by coloration, morphosculpture, and trichobothrial scores in Tv series (in which two groups overlap), but first of all by the clear external trichobothrial "polytrichy" in the Group B (Te 27 to 30, *et* 7 to 8, eb_a 5 to 6, and *eb* 5 to 6) as compared to the Group A (Te 23 to 25, *et* 5 to 6, eb_a always 4, and *eb* always 4). This phenomenon deserves attention especially since the polytrichy in the *E. carpathicus* complex can be considered a derived feature (GANTENBEIN et al., 1999).

Group A and Group B exhibit geographic vicariance as well as local sympatry, as was correctly noticed by KINZELBACH (1975). In the NMNHS material, two groups are slightly overlapping in the southwestern Bulgaria, where Subgroup B1 penetrates from the south (i.e. from Greece) by two different routes: along the Struma (Strimonas) River valley (north to Kresna), and also independently along the Maritsa (Evros) River valley (north to Pazardzhik). These two biogeographic routes are common avenues of penetration of sub-Mediteranean elements into Bulgaria (P. Beron, personal communication).

Another subgroup (B2) of the Group B is for the first time described here from the material collected in the high mountains of the northwestern Albania (Prokletija massif). The Subgroup B2 represents one of the most "polytrichous" known populations of the *E. carpathicus* complex. This remarkable population not only has standard numbers of eb_a = 6 and *eb* = 6, but also sometimes exhibits *em* = 5, a case which so far has not been recorded for any form of the *E. carpathicus* complex. This increases the maximal confirmed Te (total number of external patellar trichobothria) in *E. carpathicus* to 31 (*et* = 8; *est* = 4; *em* = 5; *esb* = 2; eb_a = 6; *eb* = 6).

On the other hand, the "oligotrichous" Group A (or Kinzelbach's *E. carpathicus* sensu stricto) is not yet recorded from Albania, but is quite common in the northern and eastern Balkans. In the NMNHS collection, it is found (Subgroups A1 and A2) all over the territory of Bulgaria, north to Montana and Veliko Turnovo, and as far southeast as the Burgas District (Sveti Vlas near Nesebur, at the Black Sea coast). In the southwest (the Struma valley) this form is sympatric with the Subgroup B1; however, I found no evidence of their hybridization.

The Subgroup A3, represented in NMNHS by the material from many of the Aegean islands of Greece, roughly corresponds to what KINZELBACH (1975) considered a hybrid "subspecies" between his two species, to which he assigned the name *E. carpathicus candiota* Birula, 1903 (originally applied only to the Crete population). It is difficult to speculate on a possible hybridization as no evidence of such is known other than an increased Tv value (9-10 in the Subgroup A3 instead of 7-8 in the Subgroup A1 from Bulgaria and northeast Greece). It should be noted that the tendency to the increase of Tv is also expressed in some

northern, mainland populations from Bulgaria which I designated as a separate Subgroup A2 (close to A1 but exhibiting clear increase in Tv to 9-10). Further genetic investigation of the Group A populations should involve analysis of the material all over the Balkans, and also from the southern Turkey, Romania and Crimea. The isolated population of *E. carpathicus* from Crimea ("subspecies" *E. c. tauricus*) appears to be very close to the Bulgarian Subgroup A1, and could be a result of a recent (Pleistocene) migration from the eastern Balkans (FET, 1997a).

Finally, a single sample from the analysed NMNHS material ("Group C" from the West Rhodope Mts in the southern Bulgaria) stands clearly apart in the *E. carpathicus* complex (to which I currently place it on the basis of non-trichobothrial characters such as metasomal morphosculpture and leg setation). This form might represent an evolutionary trend opposite to the "polytrichy", namely a dramatic reduction of trichobothrial numbers (with Tv = 6 to 7, *et* = 4 to 5, and *em* = 3). The patellar trichobothrial formula of this population matches exactly that of some forms from the *E. mingrelicus* complex; however, its ratio *et - est / est - dsb* for the fixed finger is close to 1,0 which is characteristic for *E. germanus* rather than for *E. mingrelicus*. In fact, earlier I (FET, 1993) mentioned this form from Bulgaria as *E. germanus croaticus* Caporiacco, 1950. This issue requires further detailed investigation since my observations of the type of the latter form (from Velebit Mts, Croatia) shows that it does not appear to be close to *E. germanus* (C.L. Koch, 1837) but possibly belongs to the *E. carpathicus* complex as well. Although *em* = 3 is a fixed character for *E. germanus* and *E. mingrelicus* complexes (VACHON, 1975), independent reduction of *em* series from 4 to 3 in rare cases has been recorded for the *E. carpathicus* complex, e.g. in *E. c. banaticus* (C.L. Koch, 1841) from Romania (BONACINA, 1983) and in an Aegean island specimen from Serifos (see above, with a reduction even to *em* = 2-3). The Rhodope Group C might be a candidate for a "good" species; at this moment there is not yet enough evidence to present its description as such.

It is clear now, however, that the territory of Bulgaria houses an unexpected, previously unrecorded genetic diversity within the *E. carpathicus* complex, with at least three distinct phenotypic groups (A1 + A2, B1 and C). Further investigations of the unique, dynamic genetic system represented by the genus *Euscorpius* in Bulgaria, Albania, and Greece is warranted with the application of modern morphological and molecular techniques.

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Скорпиони (Arachnida, Scorpiones) от Балканския полуостров в колекциите на Националния природонаучен музей в София

Виктор ФЕТ

(Р е з ю м е)

Върху скорпионите на Балканския полуостров са публикувани множество трудове, но тяхната систематика остава неясна, особено на полиморфния род *Euscorpius*. Анализирани са 173 скорпиона от арахнологичните колекции на Националния природонаучен музей при БАН в София, предоставени от П. Берон. Те включват видовете *Mesobuthus gibbosus* (Brullé) от Албания и Гърция, *Euscorpius beroni* sp. n. от Албания, *E. carpathicus* (L.) s. lato от България, Албания и Гърция и *Iurus dufoureius* (Brullé) от Гърция (Пелопонес и островите Касос и Родос). Полиморфният вид *E. carpathicus* (L.) е разделен на фенотипни групи и подгрупи, които са описани, без да им се дават имена. Описан е новият вид *Euscorpius beroni* sp.n. от Северна Албания (Алпет), който е най-високо живеещият скорпион в Европа и е симпатричен с *E. carpathicus* (L.).